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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/676,324	09/30/2003	Gregg A. Deluga	110.02040101	6481
26813	7590	07/21/2006	EXAMINER	
MUETING, RAASCH & GEBHARDT, P.A. P.O. BOX 581415 MINNEAPOLIS, MN 55458			COOKE, COLLEEN P	
			ART UNIT	PAPER NUMBER

1754

DATE MAILED: 07/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/676,324

Applicant(s)

DELUGA ET AL.

Examiner

Colleen P. Cooke

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 24 April 2006.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-24, 26-33, 35-40 and 42-50 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-24, 26-33, 35-40, and 42-50 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-7, 13-21, 26-30, 35-37, 42-45, and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over CA 2323728 (Maruko, Saburo) in view of Krummenacher et al. (“Catalytic partial oxidation of higher hydrocarbons at millisecond contact times: decane, hexadecane, and diesel fuel”).

CA 2323728 teaches an auto-oxidation method of producing hydrogen by contacting an alcohol and water vapor plus oxygen with a catalyst (abstract), where the alcohol can be ethanol (page 6, 2<sup>nd</sup> full paragraph, lines 5-6) and also where the catalyst is “stratified” (page 5, 1<sup>st</sup> full paragraph, lines 5-11) and loaded or packed into a bed (page 8, 3<sup>rd</sup> full paragraph, lines 1-5). CA 2323728 teaches space velocities of about 2000-8000 (page 6, 1<sup>st</sup> full paragraph). CA 2323728 does not teach that the alcohol is vaporized from a film formed on a wall of a reactor in order to contact it with oxygen and a catalyst.

Krummenacher et al. teaches vaporizing fuel by forming a film of feed on reactor walls heated to a temperature sufficient to vaporize the film, such that the film vapor then mixes with air and later passes over a catalyst (pages 333-334, under the section “2.2. Reactor”).

It would have been obvious to vaporize the alcohol in the same manner as was known to vaporize hydrocarbons because both are hydrogen-containing feeds used to produce hydrogen by

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partial oxidation and further because CA 2323728 does teach that the alcohol is used in gaseous vapor form (page 8, 5<sup>th</sup> full paragraph which continues onto page 9), it being obvious to achieve the gaseous vapor form desired by CA 2323728 using the known apparatus and method as taught by Krummenacher et al.

Regarding claims 6, 7 and 13, CA 2323728 teaches that the catalyst bed in general is maintained in the range of 700-800°C and that the alcohol reactions go on at temperatures as low as 250-350°C (page 4, 1<sup>st</sup> full paragraph through 4<sup>th</sup> paragraph continued onto page 5) and also that the gaseous mixture may be heated to the required temperature (page 5, last paragraph, lines 4-6).

With respect to claims 14, 18, 28, and 35, CA 2323728 fails to teach specifically that the alcohol and oxygen-containing gas are at a temperature of no greater than about 160°C prior to contact with the catalyst. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine the optimum operating temperature for each phase of the reaction process, since it has been held that discovering an optimum value or a result effective variable involved only routine skill in the art. In re Boesch, 617 F.2<sup>nd</sup> 272, 205 USPQ 215 (CCPA 1980). The artisan would have been motivated to select a temperature of the gas stream such that the reactions proceeds at a high rate to completion by the reasoned explanation that the catalyst bed in general is maintained in the range of 700-800°C and that the alcohol reactions go on at temperatures as low as 250-350°C (page 4, 1<sup>st</sup> full paragraph through 4<sup>th</sup> paragraph continued onto page 5) and also that the gaseous mixture may be heated to the required temperature (i.e. the gas may be at temperatures lower than 250°C; page 5, last paragraph, lines 4-6).

With respect to claims 42 and 43, CA 2323728 further teaches that one portion of the catalyst can include materials such as Ni, Si, Al, W, and/or Fe, which may be in oxide form (page 6, 4<sup>th</sup> and 5<sup>th</sup> full paragraphs) while another portion preferably has Pt or Pd (page 6, 6<sup>th</sup> full paragraph).

Claims 8-12, 22-24, 31-33, 38-40, and 46-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over CA 2323728 (Maruko, Saburo) in view of Krummenacher et al. ("Catalytic partial oxidation of higher hydrocarbons at millisecond contact times: decane, hexadecane, and diesel fuel") as applied to the claims above and further in view of Anzai et al. (2003/0060364 A1).

CA 2323728 in view of Krummenacher et al. teach as described with respect to claims 1-7, 13-21, 26-30, 35-37, 42-45, and 50 above. CA 2323728 teaches a method of producing hydrogen by contacting an alcohol and water vapor plus oxygen with a catalyst (abstract), where the alcohol can be ethanol (page 6, 2<sup>nd</sup> full paragraph, lines 5-6) and also where the catalyst is "stratified" (page 5, 1<sup>st</sup> full paragraph, lines 5-11) and loaded or packed into a bed (page 8, 3<sup>rd</sup> full paragraph, lines 1-5). CA 2323728 teaches space velocities of about 2000-8000 (page 6, 1<sup>st</sup> full paragraph).

With respect to claims 9-12, 22-25, 31-33, 38-40, and 46-49, CA 2323728 fails to teach that the catalyst comprises rhodium metal and/or oxide and cerium.

Anzai et al discloses a process similar to that of CA 2323728 (see abstract) including an autothermal process for producing hydrogen comprising contacting a composition comprising at least one alcohol (ethanol in [0053]) with an oxygen-containing gas, steam and a catalyst. The

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catalyst comprises rhodium and cerium oxide on a support. (See [0002] and [0009]). The support may be in any shape or form such as pellet, granular, honey comb, etc (See [0037]). The inlet temperature is in the range from 300 to 600°C and the outlet temperature is in the range from 500 to 1000°C (See [0049]). Anzai et al further disclose that the atomic Ce/Rh ratio is in the range from 1 to 250 and that the Rh is supported in a 0.1 to 3 % by mass (See [0038] and [0039]).

With respect to claim 8, CA 2323728 also fails to disclose the residence time of the alcohol and oxygen in contact with the catalyst and fails to disclose the gas space velocity. However, it is well known and recognized that both the residence time and gas space velocity are result effective variables. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have determined by experimentation the residence time and gas space velocity in Anzai et al process, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). Further it would be obvious for the residence time to be such that it is sufficient to allow the reaction to proceed to completion.

It would have been obvious to modify the process of CA 2323728 by using a catalyst such as that taught by Anzai et al. because Anzai et al. teaches that this catalyst desirably performs the same process.

Claims 1-24, 26-33, 35-40, and 42-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anzai et al. (2003/0060364 A1) in view of in view of Krummenacher et al. ("Catalytic partial oxidation of higher hydrocarbons at millisecond contact times: decane, hexadecane, and diesel fuel") and Hu et al. (5597771).

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Anzai et al disclose a process for producing hydrogen comprising contacting a composition comprising at least one alcohol (ethanol in [0053]) with an oxygen-containing gas, steam and a catalyst. The catalyst comprises rhodium and cerium oxide on a support. (See [0002] and [0009]). The support may be in any shape or form such as pellet, granular, honey comb, etc (See [0037]). The inlet temperature is in the range from 300 to 600°C and the outlet temperature is in the range from 500 to 1000°C (See [0049]). Anzai et al further disclose that the atomic Ce/Rh ratio is in the range from 1 to 250 and that the Rh is supported in a 0.1 to 3 % by mass (See [0038] and [0039]).

Anzai et al. does not teach that the alcohol is vaporized from a film formed on a wall of a reactor in order to contact it with oxygen and a catalyst.

Krummenacher et al. teaches vaporizing fuel by forming a film of feed on reactor walls heated to a temperature sufficient to vaporize the film, such that the film vapor then mixes with air and later passes over a catalyst (pages 333-334, under the section "2.2. Reactor").

It would have been obvious to vaporize the alcohol in the same manner as was known to vaporize hydrocarbons because both are hydrogen-containing feeds used to produce hydrogen by partial oxidation and further because Anzai et al. does teach that the liquid alcohol feedstock is evaporated, it being obvious to achieve the gaseous vapor form desired by Anzai et al. using the known apparatus and method as taught by Krummenacher et al.

Anzai et al. also does not teach that the catalyst is a stratified catalyst and fails to disclose the residence time of the alcohol and oxygen in contact with the catalyst and fails to disclose the gas space velocity.

However, it is well known and recognized that both the residence time and gas space velocity are result effective variables. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have determined by experimentation the residence time and gas space velocity in Anzai et al process, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Hu et al. teaches a stratified catalyst (see abstract) to be for production of hydrogen.

It would have been obvious to modify the process of producing hydrogen as taught by Anzai et al. by using a stratified catalyst such as that taught by Hu et al. because Hu et al. teaches that such catalysts desirably are polyfunctional and can simultaneously catalyze oxidation of hydrocarbons as well as carbon monoxide and the reduction of nitrogen oxides (see Column 1, lines 14-17 and Column 7, lines 30-43).

Claims 1-24, 26-33, 35-40, and 42-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anzai et al. (2003/0060364 A1) in view of CA 2323728 (Maruko, Saburo) and Krummenacher et al. ("Catalytic partial oxidation of higher hydrocarbons at millisecond contact times: decane, hexadecane, and diesel fuel").

Anzai et al disclose a process for producing hydrogen comprising contacting a composition comprising at least one alcohol (ethanol in [0053]) with an oxygen-containing gas, steam and a catalyst. The catalyst comprises rhodium and cerium oxide on a support. (See [0002] and [0009]). The support may be in any shape or form such as pellet, granular, honey comb, etc (See [0037]). The inlet temperature is in the range from 300 to 600°C and the outlet temperature



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is in the range from 500 to 1000°C (See [0049]). Anzai et al further disclose that the atomic Ce/Rh ratio is in the range from 1 to 250 and that the Rh is supported in a 0.1 to 3 % by mass (See [0038] and [0039]).

Anzai et al. does not teach that the alcohol is vaporized from a film formed on a wall of a reactor in order to contact it with oxygen and a catalyst.

Krummenacher et al. teaches vaporizing fuel by forming a film of feed on reactor walls heated to a temperature sufficient to vaporize the film, such that the film vapor then mixes with air and later passes over a catalyst (pages 333-334, under the section “2.2. Reactor”).

It would have been obvious to vaporize the alcohol in the same manner as was known to vaporize hydrocarbons because both are hydrogen-containing feeds used to produce hydrogen by partial oxidation and further because Anzai et al. does teach that the liquid alcohol feedstock is evaporated, it being obvious to achieve the gaseous vapor form desired by Anzai et al. using the known apparatus and method as taught by Krummenacher et al.

Anzai et al. fails to disclose the residence time of the alcohol and oxygen in contact with the catalyst and fails to disclose that gas space velocity. However, it is well known and recognized that both the residence time and gas space velocity are result effective variables. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have determined by experimentation the residence time and gas space velocity in Anzai et al process, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Anzai et al. also does not teach that the catalyst is a stratified catalyst.

CA 2323728 teaches a method of producing hydrogen by contacting an alcohol and water vapor plus oxygen with a catalyst (abstract), where the alcohol can be ethanol (page 6, 2<sup>nd</sup> full paragraph, lines 5-6) and also where the catalyst is “stratified” (page 5, 1<sup>st</sup> full paragraph, lines 5-11) and loaded or packed into a bed (page 8, 3<sup>rd</sup> full paragraph, lines 1-5). CA 2323728 teaches space velocities of about 2000-8000 (page 6, 1<sup>st</sup> full paragraph).

It would have been obvious to modify the process of producing hydrogen as taught by Anzai et al. by using a stratified catalyst such as that taught by CA 2323728 because CA 2323728 teaches that such catalyst will facilitate commencement of the reaction and conclude the reaction more quickly (page 5, 1<sup>st</sup> full paragraph, lines 5-11).

#### ***Response to Arguments***

Applicant's arguments with respect to claims 1-24, 26-33, 35-40, and 42-50 have been considered but are moot in view of the new ground(s) of rejection. Applicant's arguments, insomuch as they still apply to the rejection, filed 4/24/06 have been fully considered but they are not persuasive.

The applicant mainly presents argument drawn to the newly added claim limitation, which limitation has been properly treated above and therefore these arguments are moot.

The applicant argues that “Maruko does not teach reforming of alcohols at temperature of 700-800°C” yet does not argue that Maruko in any way fails to meet the relevant claim limitations requiring a catalyst temperature of at least about 300°C. It is noted that the grounds for rejection cite that Maruko teaches that “the alcohol reactions go on at temperatures as low as

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250-350°C (page 4, 1<sup>st</sup> full paragraph through 4<sup>th</sup> paragraph continued onto page 5)” with particular emphasis on the 4<sup>th</sup> paragraph therein.

The applicant questions the grounds of rejection of claims 20 and 21, which are both dependent on claim 18. It is noted that the new grounds of rejection, as necessitated by the applicant’s amendment, alleviate any confusion the applicant might have had as claims 18, 20, and 21 are now all under the same grounds of rejection.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

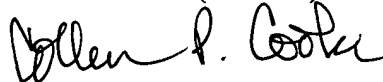
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Colleen P Cooke whose telephone number is 571-272-1170. She can normally be reached Mon.-Thurs. 8am-6:30pm.

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If attempts to reach the examiner by telephone are unsuccessful, her supervisor, Stan Silverman can be reached at 571-272-1358. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read "Colleen P. Cooke".

Colleen P Cooke  
Primary Examiner  
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